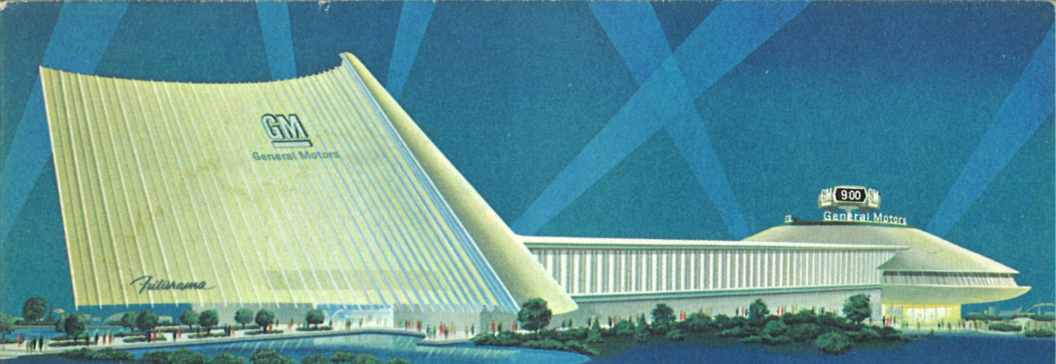
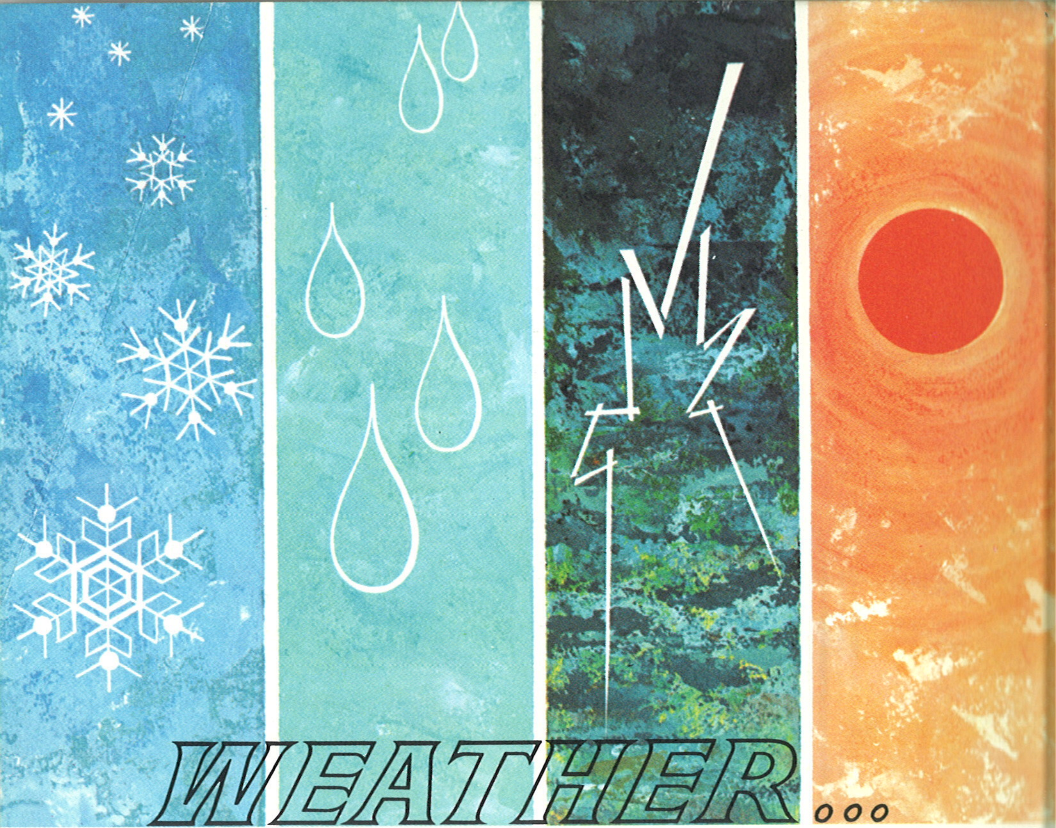


WORLD'S FAIR EDITION

YOU AND THE WEATHER



WEATHER...

good or bad, is something special to everyone.

It is our environment, and we spend much of our time enjoying it, disliking it, talking about it or trying to escape it.

Weather makes travel more inviting. It adds variety to living. Weather is a particularly successful leveler; its extremes provide total strangers with a natural topic of conversation and a shared experience.

Weather itself provides a livelihood, directly or indirectly, for a large percentage of our work force. For example: the coal, oil, gas and lumber industries; manufacturing of clothing, heating and cooling appliances, and chemicals; travel, resorts and related activities geared to all types of weather; and many, many more.

Knowledge of the weather is an important factor in our economy. The forecasts made by professional meteorologists (weather experts) help determine when aircraft shall fly, when ships should sail, when farmers should plant and harvest crops or take measures to protect them from frost or flood.

The U.S. Weather Bureau reaches more persons daily than any other agency except the postal service. The estimated value of its information and advice in increased business profits and savings to crops and property exceeds three billion dollars annually.

Man has never seemed completely content with his weather. Since time began, he has been attempting to alter it as it applies to himself. He found he was more comfortable in hot weather if he shed his animal-skin clothing and fanned himself with a leaf.

What he didn't know was that Nature had provided him with his own personal thermostat (modern Man still has it) which made him perspire when he was over-heated. Evaporation causes cooling, so exposing his skin to the air caused faster evaporation of the perspiration, and he felt cooler.

This worked fine when the air was dry, but on hot, humid days, when the air held more natural moisture, he needed the leaf-fan to speed up the evaporation.

When the weather turned cold, skin-clothing and a cave provided some relief. Then fire was discovered, and he was able to bring the heat into the cave.

And as he improved his ability over the years to keep warm in cold weather, Man started wishing he could cool his house in hot weather. And, relatively recently, he has succeeded.

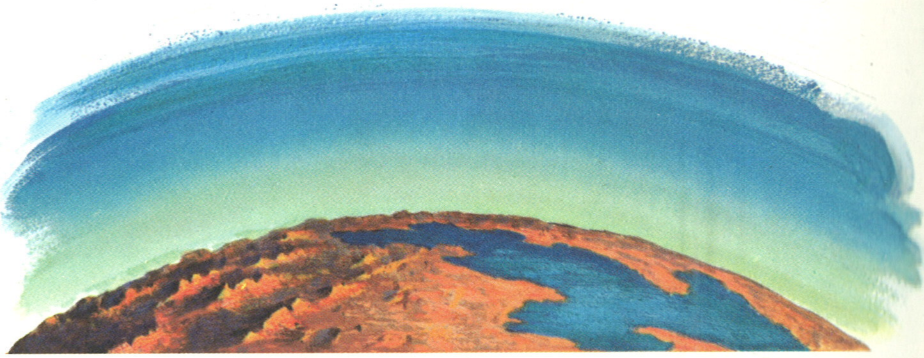
Now he can keep his house, car and office cool in hot weather and choose an air-conditioned restaurant for his lunch. Since he lives in an ever-changing climate, he can keep his house, car and office warm as the season cools.

Man's physical comfort indoors is almost total. His heating system has a built-in humidifier which automatically adds the right amount of moisture to his filtered and warmed air. His air conditioner does more than cool. It responds to his command by filling his rooms or

his car with air which has, in effect, been washed, dried and humidified and with the impurities filtered out. And he can find this comfort just about any place he spends his time.

But Man still isn't satisfied, and probably won't be, until he finds a way to control his total weather and climate with a sort of thermostat in space.

So, weather being the absorbing topic it is, let us pursue some of its whys and hows through the following pages.



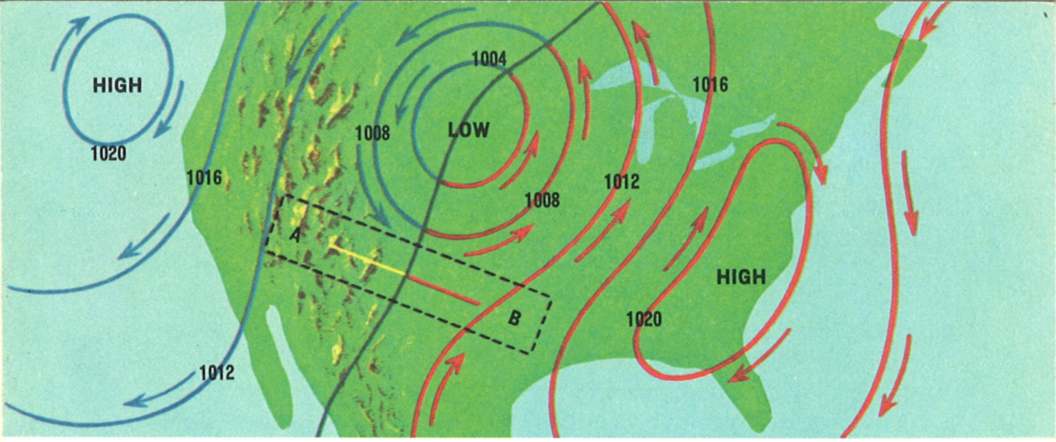
OUR OVERHEAD OCEAN

Man likes to think of himself as the conqueror of the world. Rarely would he compare himself to a fish. Yet Man does live, fishlike, at the bottom of an ocean. This ocean is the atmosphere that blankets our planet.

Earth really is not one sphere but several fitted around one another. First is the lithosphere (sphere of stone), which is the earth's land mass. Nearly three fourths of this is covered by the hydrosphere (sphere of water), or oceans, averaging nearly 2 miles in depth. Around these spheres is wrapped the transparent, ever-moving atmosphere (sphere of air), hundreds of miles thick.

Only a small part of these spheres can support life. Plants and animals live mostly on or near the surface of the ground, in the upper levels of the sea, and in the lower levels of the atmosphere. This narrow band around the earth in which life can exist is called the biosphere.

The world we know depends upon the atmosphere. Without it, the earth would be scorched by the sun on one side, frozen on the other. Deadly cosmic rays and showers of meteors would hammer the earth constantly. There would be no weather—no wind, rain, or clouds. There would be no erosion to change rocks into soil. Sound would not exist, nor fire. There would be no plants, no animals, no life at all, without the protection of the atmosphere.



HIGHS, LOWS, FRONTS—WEATHER MAKERS

The atmosphere is not a calm ocean of air, but a tossing sea laced with swift currents, furrowed by tremendous waves. And those currents and waves bring about our weather.

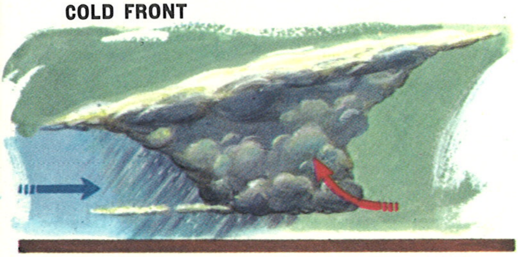
Our daily weather comes to us in a procession of what meteorologists call high-pressure and low-pressure cells, or simply "highs" and "lows." A high is a large mass of relatively heavy air, usually several hundred miles wide, in which the movement of the winds is clockwise in the northern hemisphere, counter-clockwise in the southern. Cold highs are shallow and move quickly; warm highs are deep and slow moving.

A low is a mass of lighter, warmer air rotating counter-clockwise in the northern hemisphere and clockwise in the southern hemisphere. Lows form between highs that have different temperatures.

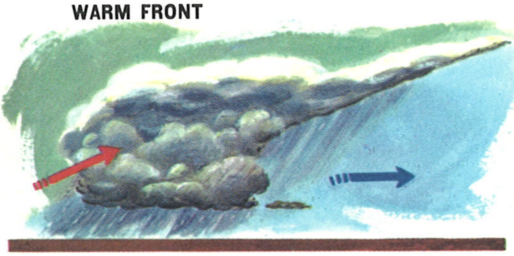
Highs and lows form and keep in fairly constant motion because of unequal heating of the earth by the sun and because of the earth's rotation. A cold high forms where cooler air accumulates (as in the polar regions in winter) and then follows a curving west-to-east path toward the equator, spreading outward as it goes.

Local weather changes as highs and lows follow one another across the earth. The weather within the forward part of a high is generally clear, dry, and sunny with north winds; as the center of the high passes, the wind swings around to the south and the weather becomes warmer, cloudy and humid. As the following low moves in, the warm

COLD FRONT



WARM FRONT



air in its southern sector tends to rise and, as it cools, its water vapor may condense into ice crystals and tiny water droplets to form vast cloud systems. These cloud systems often cause rain.

Certain locations almost always have the same pressure conditions—high or low. Near the equator is a zone of low pressure and warm, rising air known as the "doldrums."

One of the three main zones of bad weather on earth is related to it. This is the Equatorial Convergence Zone. This zone rarely shifts more than 200 miles. But in the summer months, when the land areas are heated, it sometimes moves farther from the equator and may merge with one of the two other great storm areas—the North and South Polar Fronts.

At the Equatorial Convergence Zone, the Trade Winds from the northeast and southeast come together. Both of these great wind systems are made up of masses of warm, moist air. Coming together, these masses soar upward. And in the cool heights, rain clouds often form.

(The word 'trade' is an old term for course, or path. Thus, the Trade Winds were so named because they blow almost continuously over the same course toward the equator, from the northeast above the equator and from the southeast below it.)

A 'front' is the leading edge—usually very uneven—of any moving mass of warm or cold air. At the North and South Polar Fronts, cold air streaming out from the Polar Highs meets the warm air spreading northward and southward from the tropics. Cold air is heavier than warm air, so in its advance toward the equator it pushes under the warm air moving toward the poles. Sweeping upward, this warm, moist air cools, leading to clouds, mist and rain over wide areas.

Meteorologists speak of four kinds of fronts, which appear often on daily weather maps. These are cold, warm, occluded and stationary fronts.

A cold front comes when warm air retreats before a swift-moving cool air mass. Often the cold air shoves the receding warm air upward, causing violent winds and thunderstorms, followed by clear skies in the sinking cool air behind.

A warm front develops when a warm air mass advances up and over a retreating cooler one. This slow over-spreading may cover a large area—perhaps several states. The warm air slowly cools as it rises and its vapor may condense to form clouds and a steady, monotonous rain.

An occluded front develops when a cool front overtakes a warm front and hoists it aloft, leaving only cool air at ground level. The weather then may have characteristics of both cold and warm storm fronts.

Once in a while a cold or warm front stands still. Until it moves on, it is called stationary.

WINDS AND OUR SPINNING GLOBE

The sun's heat and the spinning of the earth cause our winds. Winds are possible because the atmosphere is made up of gases. The molecules of gases are free to move in all directions.

When warm air is surrounded by cool air, the latter tends to move toward the warm air. Thus winds begin.

Now if the earth did not rotate, the air on the side of the earth facing the sun would keep being warmed. The surrounding cool air would move toward the heated air, causing it to rise and flow toward the poles. All the earth's winds would move in toward this area at the surface and out from it aloft.

But the earth does rotate. At the equator the speed of rotation is about 1,000 miles per hour. As you go north or south, the speed decreases. Because of this difference in speeds, air currents curve as they pass over the earth's surface.

Most weather is related to the behavior of these great continuous circumpolar whirls. In summer the circumpolar whirl contracts, and warm air moves toward the pole. In winter the whirl edges two-thirds of the way to the equator, carrying cold air over many lands.

How these great air movements are related to one another, and what they mean to us in terms of daily weather, is still only partly understood by our weather experts.

HURRICANES, TORNADOES, THUNDERHEADS AND RAIN

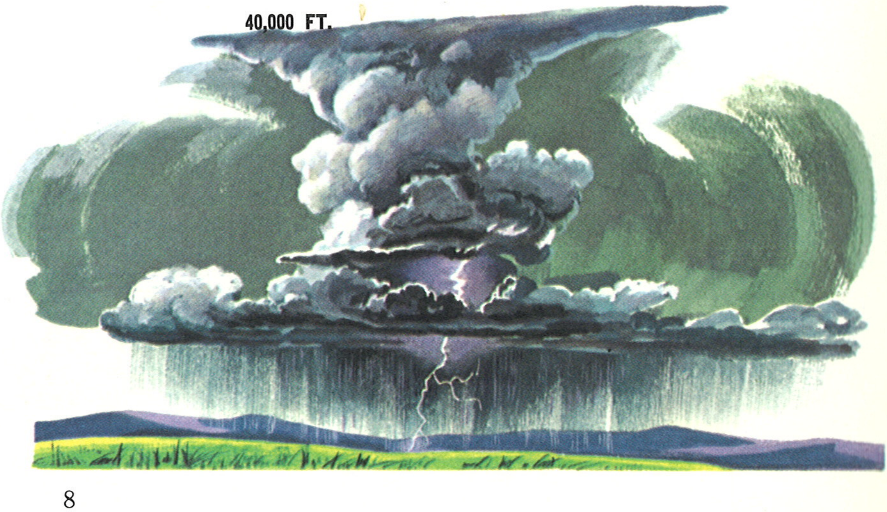
It is in zones of low pressure that most storms begin. Storms come, as we know, in many forms, ranging from the light April shower to the blizzards of winter and the driving, heavy thunderstorms of summer. But two types are the most vicious: the hurricane—or typhoon, and the tornado. The hurricane is the terror not only of seamen but of landlubbers along the coasts, too. The tornado ordinarily ravages only the Mississippi River valley and adjacent flat lands.

How does a hurricane start? Somewhere in the doldrums, warmed moist air begins rising in a slow spiral over the ocean surface. More moist air moves in to replace the rising air. As the air swirls up to cooler levels, its water vapor begins to condense into clouds and rain, releasing much heat in the process. Condensation releases more and more heat, the heated air swirls upward faster and faster, and the original slow spiral becomes a violent storm with winds circling at speeds up to 150 miles an hour. Across the ocean moves this hurricane, with an "eye" of calm air at its center and death-dealing gales at its edges. For several weeks it threatens shipping and spreads destruction over any shores it touches. At last, its energies spent, it dies away.

The dreaded tornado commences when a funnel shaped cloud lowers from the base of a violent thunder cloud, often riding just ahead of an active cold front in spring. An approaching full grown tornado roars with the sound of a hundred freight trains. Eerie bluish lightning flashes continuously in the center of the maelstrom of winds screaming at 200 to 300 miles per hour or greater. Buildings, automobiles and railway cars are whirled into the air. This narrow storm, a fraction of a mile wide, hops and skips for distances from a mile or two to a hundred or so before disappearing.

Thunderstorms that form from the fleecy white cumulus clouds of sunny days are more familiar to us than hurricanes or tornadoes. Yet thunderstorms can be a majestic sight. Sometimes the cumulus clouds from which they form pile up to heights of 40,000 feet and more. They rise up until their tops meet resistance from still higher air masses and flatten out.

Inside these thunderheads, water droplets and ice crystals are continually swept about by violent updrafts and downdrafts. They may evaporate into invisible vapor, or fall as rain or hail.



How does a lightning flash happen? What is thunder?

At times the negative charge within a cloud builds up tremendously. When the "negative potential" rises to between 10 million and 100 million volts, then it must be relieved. An electrical discharge either within the cloud or from the cloud to earth is necessary to accomplish this, for earth has a positive charge.

The swift flashes of electricity traveling between earth and cloud, charge and electrically excite molecules of air all along the path. These heated molecules glow, and it is their glow that we see as a flash of lightning.

The air suddenly expands as it is heated, and this expansion sets up vibrations—sharp, sudden movements—in the air. When these vibrations reach our ears, we call them thunder.

But how does rain form?

In the very high clouds, it is believed, water vapor evaporates from cloud droplets and collects on tiny crystals of ice until they are heavy

IDEAL *INDOOR* WEATHER

For the time being, at least, Man's desire to control his weather —outdoors—is just a dream. But consider the way he has applied himself to his indoor weather problems, and how far he has come in just about one generation.

Not very long ago, houses were heated by open fireplaces, pot-bellied stoves, kitchen wood ranges and then hand-fired coal furnaces. Heating was a constant struggle besides being messy and a general nuisance. And just about all Man could do about the hot weather was complain.

Now, however, he can set a dial on the wall at the temperature he likes best, and regardless of the season, his home will stay comfortable . . . especially if he has Delco 365 Conditionair equipment. The fuel for heat may be oil or gas, according to his preference.

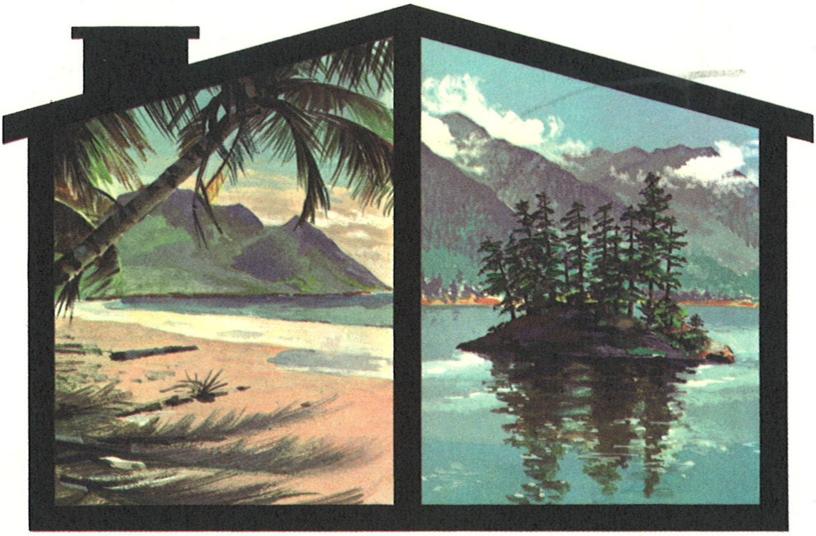
And the same installation that heats his house will whisper cleaned, filtered, cooled air through the same duct-work, automatically, when the weather outside gets hot and humid.

365 DAYS A YEAR!

Warmed or cooled, the air that fills the house is relieved of impurities and has just the right amount of moisture added for healthful comfort.

More and more new homes are being planned for the year 'round houseful of comfort that comes from the Delco 365 Conditionair. And more and more older homes are being modernized to include this superbly engineered combination of heating and air conditioning.

While it is true that Man has made great progress in his understanding of weather and in his ability to stay comfortable indoors, even greater progress is ahead. And wherever that progress leads, Delco will be there, providing ideal weather *indoors* . . . 365 days a year.



enough to fall. On reaching warmer levels, they melt and fall as rain. In lower clouds each water droplet forms probably about some tiny particle of dust or salt floating in the air.

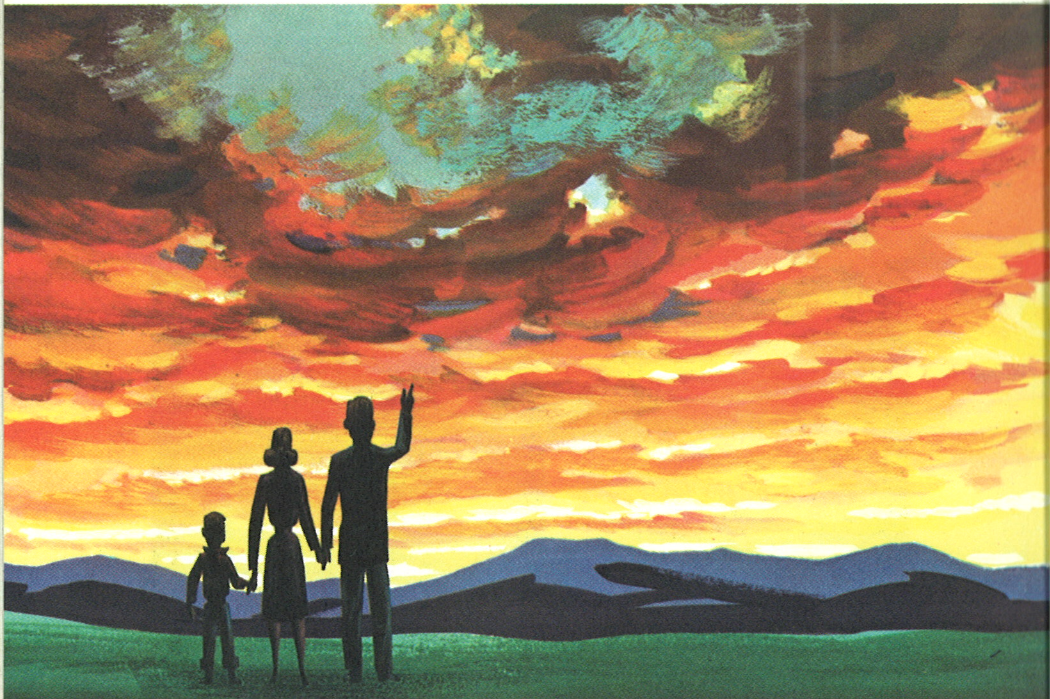
Electricity, too, seems to have an important part in rain. Each water droplet has an electrical charge. But each droplet of water is surrounded by air molecules carrying an opposite charge which neutralizes the droplet's charge. It is believed that a cloud can shed rain only when something happens to upset this balance.

Perhaps a sudden updraft sweeps the air molecules to the upper part of the cloud. Then the charged droplets left behind can grow heavy and fall, gathering others as they go. And down comes the rain.

PAINT BRUSH OF THE SKY

Where does the color in the sky come from? The sun's rays contain light of all the colors we know. Air molecules are just the right size to stop many of the blue rays and scatter them across the sky. The sun appears red or yellow at sunrise or sunset because the long path of the sun's rays through the atmosphere removes most of the blue light, leaving an excess of red or yellow light in the sun's beams.

This scattering of blue light occurs mainly in the lowest 12 miles of our atmosphere. Beyond that, the sky is violet. Beyond about 20 miles, there is only blackness.

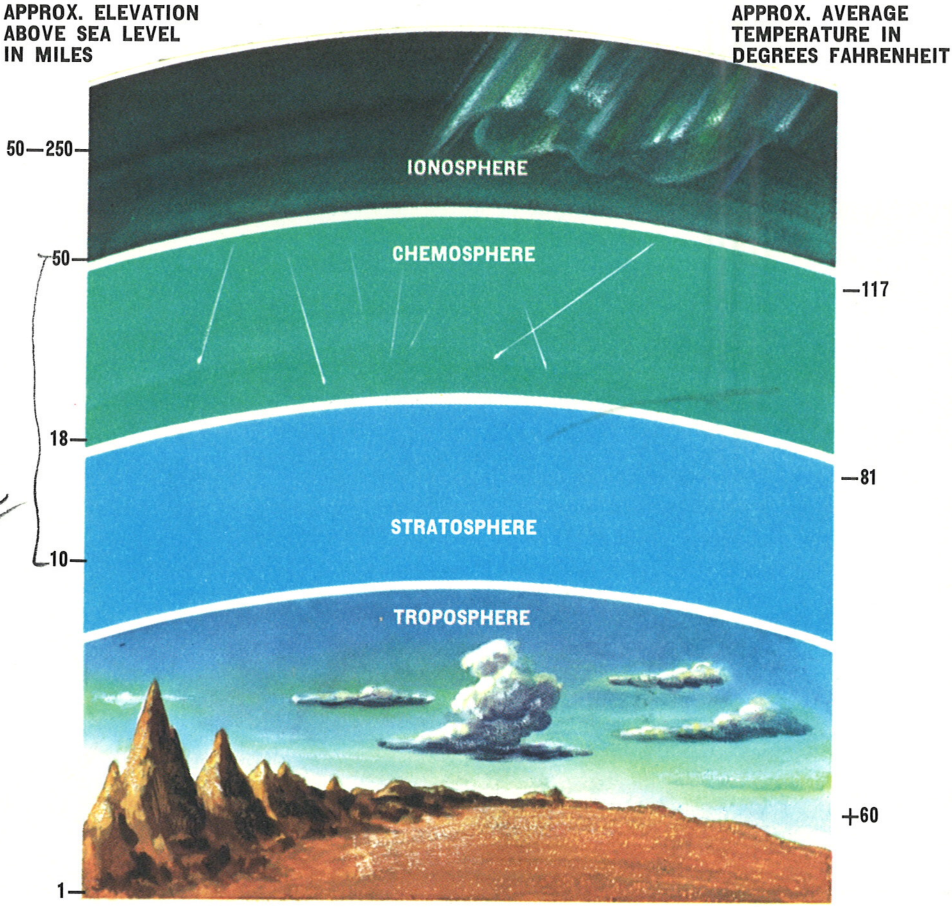


Rainbows, halos, and coronas also result from the atmosphere's acting on sunlight. The light is bent or scattered by raindrops, tiny ice crystals, or droplets of cloud moisture. Different colors in interesting patterns result.

THE THINNING AIR

Air rapidly becomes less and less dense as you move out from the earth's surface. Six miles up, it is too thin to breathe. Twelve miles up, it no longer has enough oxygen to keep a candle burning. The greater the altitude, the fewer the molecules of any gas, and the greater the empty spaces between them. For every million molecules at sea level, there is only one molecule 60 miles up.

The bottom layer of air, about 10 miles thick, is called the troposphere. It contains 75 percent of the atmosphere's weight. Around it, averaging 8 miles thick, lies the calm stratosphere. At about this level, a very important process takes place. Here the short-wave



(ultraviolet) rays of the sunlight excite oxygen molecules to form a thin layer of gas called ozone. Only a few of the ultraviolet rays get through this ozone layer and down to earth; they kill bacteria, prevent rickets, and cause sunburn. The long rays (infrared) come through to give earth its warmth.

Above the stratosphere the chemosphere stretches out to about 50 miles from earth. Next, the ionosphere stretches from 50 to 250 miles up. (It was in this layer that Col. John Glenn flew, as America's first man in orbit.) And from 250 miles toward empty space extends the almost airless exosphere.

For 7 miles or so above the earth it gets steadily colder, because you are leaving the layer of air near the surface which is warmed by the oceans and continents. The temperature drops to about —81°F. at around 18 miles up.

Then, in the ozone layer, the temperature rises again because so much of the sun's heat is absorbed there. About 50 miles out, the temperature drops once more, to around —117°F., because the ozone has almost completely disappeared by then.

THE FRIENDLY CLOUDS

If all the moisture in the atmosphere suddenly fell at once, it would cover the earth with a layer of water only one inch deep. Yet water vapor—water in evaporated form—is one of the most important gases in the air. We can see it in the form of clouds. It holds much of the heat being radiated from the earth's surface.

Without moisture in our atmosphere, suffocating dust clouds would roll over the earth. The temperature would rise and fall to dreadful extremes. In fact, without moisture there would be neither weather nor life, as we know it, on earth.

On clear, dry days the moisture is invisible vapor. We see the moisture when it falls as rain, hail, or snow; when it appears on the grass as dew or frost; when it coats trees with ice. We see it when tiny droplets (5 billion to a teaspoon!) shroud the earth in fog or ride the air as clouds.

Whether moisture will be visible as clouds depends mainly on temperature. Warm air can hold more moisture in the invisible, transparent form of vapor than cool air. When moist air is cooled, condensation takes place. Some of the vapor turns to liquid droplets (rain or fog) or ice crystals which can be seen.

Sometimes after sundown, when the earth gives up the sun's heat, the lower air cools. Fog forms in the hollows, or drops of dew form on the cool ground.

Sometimes winds carry warm, moist air over cool surfaces, forming

1. High Clouds (cirrus)
Usually snow-white, these feathery clouds of ice crystals form above 20,000 feet. Known as "mares' tails" when high winds blow them about the sky.

2. Middle Clouds (alto-cumulus)
Made up of globular puffs, gray or whitish, resembling a herd of lambs, they form about 6,500 feet up and consist of water droplets. Also known as a "mackerel sky."

3. Low Clouds (stratus)
With bases ranging from near the earth's surface to 6,500 feet, these form a fairly uniform, dull gray blanket. This is the "leaden sky" which often brings a monotonous drizzle.

4. Vertical Clouds (cumulus)
Riding across the sky like heaped-up cotton balls, these friendly clouds usually mean fine weather, but they can pile up into tower-like formations and become thunderheads.

fog or low banks of stratus clouds. Moist breezes from the sea blowing in over winter-frozen land often produce wet fogs. Or warm summer air may blow out from land over the cooler sea and form a sea fog.

Moist warm air simply brushing against a cold glass will deposit some of its water vapor as drops on the outside of the glass.

Warm air may be cooled by rising as well as by traveling over a cool surface. When it reaches cool enough heights, clouds form. On sunny days these are often cumulus clouds. Each cloud is really the top of a column of rising air, invisible until its water vapor has condensed and formed a visible mass.

Warm air sweeping up a mountainside will also cool; so many mountains wear caps of cloud.

WEATHER AND CLIMATE—CONSTANT CHANGE

Weather changes from day to day. Climates change over long periods. Today our climates are growing slowly warmer. Some glaciers—the rivers of ice in mountains—and the ice caps over the poles, are melting. We are living toward the end of a million-year-long Ice Age.

This Ice Age has included all the history of man. For most of the earth's existence the polar regions were free of ice. Before Man arrived, temperatures were mild all over the earth. Animals ranged more widely, and plants spread over the areas that are barren today.

Much more recently, changes in climate have influenced human history. Long wet and dry periods have produced jungles or deserts where civilizations once flourished. Many pueblos of the American Southwest were abandoned when land around them became too dry for farming. On the contrary, cities of the Mayan and Cambodian peoples, in Mexico and Indo-China, were swallowed up by jungles during centuries of heavy rainfall, and these had to be abandoned too.

The best climate for a high civilization seems to be one with stimulating, changeable weather, moderate temperatures, and sufficient rainfall. Historians tell us that rainfall was decreasing when both the Greek and Roman civilizations declined. A more favorable climate is enjoyed today by much of northern Europe, Great Britain, and parts of the Soviet Union, as well as the United States and Canada.

But will we always have the climate we have today? Our land is warming up, perhaps because we have fewer forests to use up the carbon dioxide and give off oxygen to keep the balance.

The carbon dioxide in the atmosphere has increased by 10 percent in the last 50 years and it is still increasing. It tends to make the earth warmer because it lets the sun's rays through undiminished but reduces the loss of heat from the earth to space.

THE METEOROLOGIST AND HIS TOOLS

Accurate weather forecasting depends on the cooperation of thousands of trained individuals all over the world, working on a tight schedule. And despite the popular jokes, the experts achieve better than 85% accuracy in 24 to 36-hour predictions and above 95% accuracy in 12-hour forecasts for aviation.

Great technical skill and a battery of precise instruments and methods are the meteorologists' working tools. The United States Weather Bureau has more than 400 observation stations along the nation's airways. In addition, more than 9,000 cooperative, part-time weather stations make regular reports in this country and a world-wide network of stations under the World Meteorological Organization (a UN agency), sends information on world conditions. Added to this are reports relayed from merchant ships at sea, airliners in flight, and from the facilities of the Coast Guard, Air Force, Navy and the Federal Aviation Agency.

Observations are made with the aid of special instrumented balloons which report by radio on cloud ceilings, wind direction and velocity, and temperatures at various levels in the atmosphere. Other instruments measure precipitation, sunshine duration, humidity, barometric pressure and other factors, and radar is used to track storms.

All this variety of precise information is assembled on weather maps in every region and on master maps at the Bureau's headquarters in Washington, D.C. Thus, records of conditions in all corners of this country and in most of the world are available at all times and are changed as often as every six hours. These are the sources of the weather reports and maps you watch and listen for in your newspaper, on radio and TV.

Modern weather-watching in this country evolved from the daily records started in 1644 near Wilmington, Del. by the Rev. John C. Holm. He was followed by a succession of interested individuals, including Thomas Jefferson, who kept private records. During the War of 1812, the government started collecting weather data through the Army Surgeon-General's personnel at hospitals.

A Weather Service was formed by law in 1870 and attached to the Army Signal Corps, which operated it until 1891, when it was changed to the Weather Bureau and transferred to the Department of Agriculture. The Department of Commerce took over the Bureau's operation in 1940.

A CRYSTAL BALL AND THE WEATHER'S FINGERPRINTS

How do the weather experts see the future for weather reading?

The optimists among them see giant steps ahead. They see not only tighter, longer-range forecasts of the earth's weather, but also a good possibility Man may achieve his dream of modifying and eventually controlling his weather and climate.

The pessimists among them hope for great things, but realize there is hard work to be done. Whether optimist or pessimist, all of them wish more young men and women with a flair for math and physics would consider meteorology as a life work.

Such specialists in the near future will be keeping their fingers on the pulse of the atmosphere more and more knowingly through the use of space probes and the fantastically instrumented weather satellite systems.

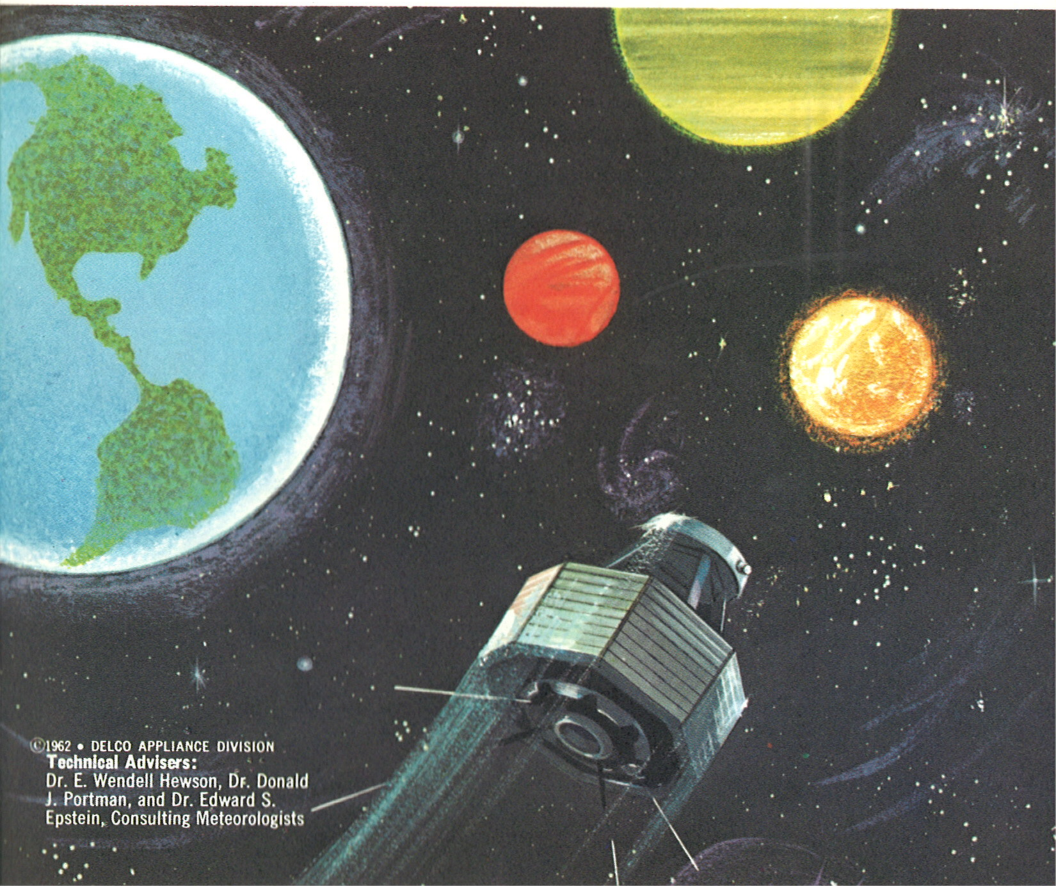
And because each new satellite sent aloft will carry improved instruments and better television cameras, the scientists will be receiving clearer pictures of cloud formations. These are important because the cloud formations are the weather's fingerprints. To the meteorologist they identify storms in the process of building up, raging at full force and dying away.

The information sent to earth by these methods and by others still to be developed, will be fed into new and greater electronic computers which will issue more accurate forecasts, perhaps for periods of 30 days and more. (Computers even now are turning out forecasts and drawing their own weather maps.)

These tighter, longer-range predictions will have a direct impact on our lives as civilians, because not all the weather experts are in government service.

Private and industrial meteorologists are kept busy. Most airlines employ their own. Movie production companies arrange their outdoor shooting schedules on the advice of private forecasters and save millions of dollars annually thereby. Major utilities and other industries and department stores call on consulting meteorologists to help them decide how much power to generate, whether to make more or less ice cream, whether to feature topcoats instead of overcoats, rubbers instead of boots, and just what the market for cold remedies is likely to be.

Weather forecasting is big business—and it IS accurate. So the next time your weatherman makes a prediction that misses, remember he just forecasts the weather, he doesn't make it—yet.



Technical Advisers:
Dr. E. Wendell Hewson, Dr. Donald J. Portman, and Dr. Edward S. Epstein, Consulting Meteorologists

GM Delco 365 CONDITIONAIR

WORLDS of year round comfort
FAIR indoor weather every day

Wherever you may live—whatever the climate in your area—your first consideration in equipping your home with a heating and cooling system is your family's everyday comfort; comfort that's automatic, economical and requires minimum maintenance.

A GM Delco 365 Conditionair will give you this comfort plus the important extra benefits of cleaned and filtered air for more healthful, enjoyable everyday living for your entire family.

With Conditionair in your home you'll notice furniture needs less dusting, draperies and curtains stay clean longer and, with the controlled humidity, fine wood surfaces will retain their finish longer.

If you're building a new home, remodeling your present one or modernizing an old heating system, plan to see your GM Delco dealer. He's a residential specialist and Delco 365 Conditionair was designed for any type of home—including one like yours.

DELCO APPLIANCE DIVISION

GENERAL MOTORS CORPORATION • ROCHESTER, NEW YORK 14601

See our World's Fair Exhibits at the G. M. Futurama and the House of Good Taste

YOUR LOCAL DELCO HOME CONDITIONING DEALER
IS LISTED IN THE "YELLOW PAGES"
OF YOUR TELEPHONE DIRECTORY UNDER "AIR CONDITIONING"

LITHO IN U.S.A.